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(54) **FIBROUS SHEET CARRYING INFORMATION, METHOD OF MANUFACTURING SAME AND APPARATUS THEREOF**

BLATT AUS FASERMATERIAL ALS INFORMATIONSTRÄGER, VERFAHREN UND APPARAT ZU
DESSEN HERSTELLUNG

NAPPE DE FIBRES PORTANT DES INFORMATIONS ET PROCEDE ET APPAREIL DE
FABRICATION ASSOCIES

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Description

The present invention relates to a process for printing indicia capable of providing information, such as characters, a pattern or an identification mark, etc. on a fibrous sheet (fibrous fabric) such as a woven, knitted or non-woven fabric, and also to an indicia-bearing fabric prepared by the process and to an apparatus for preparing the indicia-bearing fabric.

To record such information by providing indicia such as characters, a pattern or an identification mark, etc. on a fabric, so-called textile printing using a dye or pigment has been practiced for maintaining good washing resistance and wear resistance. However, textile printing requires a printing plate for each pattern and is too poor in its flexibility of application to entertain changes of image. When information-bearing fabrics of various kinds are produced in respective small quantities, for example, when serial numbers are changed each time a recording is printed, such a textile printing process is impractical.

Having regard to the above requirement for flexibility, various printers used for OA apparatuses seem particularly promising. These printers include (1) a heat transfer printer, (2) an impact printer, (3) an electrophotographic printer, (4) ink jet printer and (5) a sublimation type heat sensitive transfer printer, for example, as disclosed in US-A-4997452, which describes a printing process using such a printer for providing a colour printing process using such a printer for providing a colour image, but including, as a preliminary step, subjecting the transfer sheet to heat pressing against a sheet of absorbent paper to remove excessive dye.

Another method of removing excessive dye during a printing operation is disclosed in JP-A-50-094284. Here a dye impregnated polyester fabric and another fabric impregnated with an aqueous mixture containing a dye absorber are steamed together at high pressure so that excessive dye migrates to and is absorbed by the other fabric.

Referring now to the abovementioned printers (1) - (5), printers (1) - (3) use mainly pigments as coloring agents. However, on application of a pigment to a fabric, even though an image can be formed temporarily by a pigment on a fabric, washing, friction, etc. easily deprive the fabric of the pigment, so these printers cannot be said to be suitable for fabrics. On the other hand, printers (4) and (5) are described below in detail.

For the ink jet printer, we began to study a method of printing an ink containing a dye and heating it for dyeing to allow application of the printer to fabrics. In one known method of ink jet printing, a fiber structure is first impregnated with a watersoluble metal salt or cationic nitrogen-containing substance, subjected to said jet printing and thereafter to development using wet heat (see JP-A-61-231286). Excessive dye, together with other water soluble substances are then washed off. In general for ink jet printed fabrics, since the ink is liquid,

printing on a fabric not treated at all causes blurring, not allowing a clear image to be obtained. So, before printing, the fabric must be treated to prevent blurring, thus raising the cost disadvantageously. Even if the additional cost of treating the fabric for preventing blurring is disregarded, all the dye applied is not fast deposited on the fabric, and some of the dye remains loose to pose a serious problem in view of a lack of fastness to friction, re-contamination, etc.

On the other hand, in the case of the sublimation type heat sensitive transfer printer, a sublimable dye is used, and unlike application of the ink jet printer, treatment of the fabric for preventing blurring is not required. So, this type of printer seems to be preferable. However, the sublimation type heat sensitive transfer printer requires the use of a very highly sublimable dye in order that a low heating temperature may be employed; otherwise, at a higher temperature the thermal head used in the printer has a shorter life. If such a very highly sublimable dye is used for dyeing the fabric, it is low in its fastness to washing, ironing, etc., and the conventional sublimation type heat sensitive transfer printer cannot be immediately applied to fabrics. The sublimation type heat transfer technique can be used for printing fabrics if the dye used is good in fastness, but the use of such a dye good in fastness reduces to an impractical extent the life of the thermal head in view of the high sublimation temperature then required.

As described above, conventional printing techniques cannot provide images excellent in washing resistance and wear resistance, with flexibility to changes of image at low running cost.

In addition to the above problems, printers other than the ink jet printer require the recording medium to have a smooth surface, and so must overcome the problem that ordinary fabrics are very poor in surface smoothness compared to paper, etc.

The present invention provides a printing technique for fabrics, which satisfies all of flexibility to changes of image, washing resistance and wear resistance of printed images and low running cost.

According to a process aspect, the invention provides a washless process for providing a fibrous sheet with a permanent information-bearing image, which process comprises printing the fibrous sheet with a colouring agent mainly composed of a dye and removing excessive dye therefrom so as to provide, on the fibrous sheet, the permanent information-bearing image, characterised in that

- (i) an image is formed temporarily on the fibrous sheet by a technique selected from a heat transfer technique, an ink jet printing technique and an impact printing technique;
- (ii) the fibrous sheet bearing the temporary image is heated so as to enable the dye to migrate into the fibrous sheet; and
- (iii) the excessive dye is removed from the fibrous

sheet by a washless process in which a sheet capable of receiving the excessive dye is pressed against the fibrous sheet while heating so as to effect the said excessive dye removal;

the said steps (ii) and (iii) being carried out simultaneously with, or separately from one another.

For recording images on fabrics, the use of a dye is most preferable in the present situation, having regard to washing resistance and wear resistance. Furthermore, also considering the flexibility to changes of image, the sublimation type heat transfer technique uses a highly sublimable dye, and since most of the present recording paper materials use a porous polyester resin as the surface layer, the technique might be expected to be highly compatible with a fabric as a recording medium, especially a polyester fabric.

However, since a sublimable dye is used, repeated washing and ironing deprive the fabric of the dye. To avoid this phenomenon, that is, to improve the fastness of the dye, it is very effective to use a dye having a sublimation temperature higher than that of dye in current use. However, at present the sublimation type heat sensitive transfer printer requires a highly sublimable dye; otherwise the higher heating temperature required for a dye more difficult to sublime would shorten the life of the thermal head.

We conducted intensive studies in an attempt to find a method of flexible applicability which could be used to form images on fabrics using a dye high in sublimation temperature and excellent in fastness, and considered the application of a heat transfer printer or impact printer which now uses a pigment as the coloring agent. We found that if a ribbon mainly containing a dye high in sublimation temperature is used in such a printer instead of the conventional ink ribbon, to form a temporary image on a fabric and another sheet material is pressed against the fabric, for absorbing the excessive dye by heating, then the dye can be well fast deposited in the fibers constituting the fabric, to achieve a practically sufficient fastness to friction.

Since excessive dye remaining loose after fast dye deposition remarkably worsens the fastness to friction, attempts were made to remove it using an aqueous material, for example, by reduction washing. However, in a method of the present invention, instead of such a method a dry method is used to allow the production of a dry information-bearing fabric. This also overcomes the poor fastness to friction which has also been a problem with ink jet dyeing.

As for the timing of heating with a sheet material pressed against the fabric, a second heating can be effected after the image providing information has been temporarily formed on the fabric by a coloring agent mainly composed of a dye has been subjected to a first heating operation so as to enable migration of the image into the fabric, or heating can be effected merely after the sheet material has been pressed against the fabric

with the image temporarily formed. In the former case, the dye can be efficiently fast deposited in the fibers of the fabric, by the first heating, and then heat pressed against the sheet material (second heating) to remove excess dye. In the latter case, heating is required only once both for fixing the image in the fabric and removing excess dye. Either method can be selected as required.

For forming a dyed image on a fabric, a temporary image can be formed on a sheet such as paper or polyester film by a printer using an ink or ink ribbon, etc. containing the dye, and the sheet can be pressed against the fabric with heating, to fast deposit the dye into the fibers constituting the fabric, based on the above concept. The above method of removing the excessive dye can also be applied in this case.

The sheet material used for removing the excessive dye from the fabric can be any material, but a sheet substantially made of a polyester or polyolefin can be preferably used since it is liable to absorb the excessive dye. Furthermore, a cellulose based material such as paper can also be used. In this case, the running cost can be low, and especially for forming the temporary image by the heat transfer method, the cellulose based material can be preferably used.

If the sheet material is a film, since it is good in adhesion to the fabric, it is liable to absorb the excessive dye, and so can be preferably used.

In a process of the present invention, the heating method for enabling the dye to migrate into the fabric and for removing the excessive dye is not especially limited, but in view of heat transfer efficiency, heating in a water vapor atmosphere is preferable. Furthermore, from the viewpoint of miniaturization as pursued in OA apparatuses, heating by hot air is also preferable. In any event, pressurization using a hot roller, etc. is also preferable in view of heat transfer efficiency, and can be preferably used especially for heating by hot air. For pressurization by a hot roller, etc., the hot roller, etc. may be provided for this particular purpose only. Alternatively, a hot roller may be used additionally for other purposes; for example, if a hot melt type adhesive film or fabric is bonded to the fabric when bearing a temporary image, a hot roller is preferably additionally used for this bonding operation.

The dye used in the present invention can be, for example, a disperse dye or basic dye, and is not especially limited in kind, but should be preferably a sublimable dye with a sublimation temperature of 180°C to 300°C, more preferably 200°C to 250°C. In short, it is preferable to use a dye with high fastness. The above sublimation temperature refers to the temperature at which the vaporization pressure of the sublimable dye (sublimation pressure) becomes equal to the external pressure.

In the new method for forming an image on a fabric as described above, a printing technique such as heat transfer printer or impact printer is used for forming a temporary image, so that a fabric with a smooth surface

can be preferably used, for obtaining a clear temporary image. However, conventional fabrics are very poor in surface smoothness compared to paper, etc. and therefore very low in transfer efficiency. If an ink jet printer is used, the fabric is not necessarily required to have a smooth surface, but a fabric treated to prevent blurring can be preferably used.

In processes embodying the present invention, the recording medium used can be preferably a woven or knitted or nonwoven fabric mainly composed of extra fine fibers each of 0.0001 to 1 denier (0.00011 to 1.1 dtex), more preferably 0.0005 to 0.3 denier (0.00056 to 0.33 dtex), further more preferably 0.001 to 0.1 denier (0.0011 to 0.11 dtex). A fabric of such fibres is good in surface smoothness, and a temporary image can be formed with clearness substantially equivalent to that achieved on paper, using a printing device such as a heat transfer printer, impact printer or ink jet printer. A fabric composed of extra fine fibers with polyamide fibers and polyester fibers well mixed is especially preferable since it has a surface excellent in compactness, thus smoothness.

It is also preferable to treat the surface of the fabric by water jet punching, for opening and/or intertwining the extra fine fibers, to make the surface more compact. Such treatment also remarkably improves the form stability of the fabric. Furthermore, calendering is also very preferable since it improves the surface smoothness and makes the fibers more intertwined to achieve higher dimensional stability.

The method for preparing the above extra fine fibers is not especially limited, and various conventional extra fine fiber production techniques can be applied as they are.

The cross sectional form of the fibers is not limited to be circular, but can also be triangular, square, rectangular, ellipsoidal or polygonal. Rather, ellipsoidal or rectangular fibers looking flat can be said to be preferable since the surface smoothness is better than that of other formed fibers with the same single fiber size.

When the fabric is woven or knitted, the numbers of threads of warp and weft, the number of fibers constituting each thread and the weaving or knitting densities are important factors for achieving the effect of the present invention preferably. The product obtained by multiplying the numbers of the fibers constituting warp and weft should be preferably 5,000,000 or more per square centimeter, and the product obtained by multiplying the weaving or knitting densities of warp and weft threads should be preferably 1,000 or more per square centimeter. Especially when these values are satisfied, the dyeing efficiency of the dye sublimed from the temporary image formed on a woven or knitted fabric to the woven or knitted fabric is very good, and a very practical optical density and a clear pattern boundary of the image can be obtained.

Similarly, a nonwoven fabric should be preferably very compact and as flat as possible in surface struc-

ture. Specifically, we have found that a fabric of 0.15 g/cm³ or more in apparent density is preferable, though this is not restrictive. Therefore, for example, a spun bond nonwoven fabric or short-fiber nonwoven fabric treated by calendering or water jet punching can be preferably used. The apparent density given below refers to the value expressed by the following formula:

$$\begin{aligned} &\text{Apparent density (g/cm}^3\text{)} \\ &= \text{Unit weight (g/cm}^2\text{)}/\text{Thickness (cm)} \end{aligned}$$

The present invention also provides an apparatus for printing a fibrous sheet so as to provide indicia thereon, which apparatus comprises a printing device capable of forming a temporary image on a fibrous sheet by a printing technique carried out in the absence of water and selected from a heat transfer technique using a heat transfer ribbon, an ink jet printing technique and an impact printing technique using an ink ribbon, and a press capable of heat pressing another sheet capable of receiving excessive dye material against the fibrous sheet, so as to enable migration of dye forming the indicia into the fibrous sheet and transfer excessive dye to the said other sheet.

Such an apparatus can be used to apply the above mentioned concept, in order to print a fibrous sheet so as to provide indicia-bearing fabric. The printing device is capable of forming a temporary image by application of a coloring agent mainly composed of a dye to a fabric by at least a heat transfer technique, ink jet printing technique or impact printing technique. Heat-treating the fabric enables migration of the dye forming the indicia into the fabric and the press for heat pressing a sheet material against the heat-treated fabric for heat treatment enables transfer of excessive dye into the sheet material. The apparatus may additionally comprise a heater for heat treating the fabric, which heater is dispersed between the printing device and the press. Furthermore, it is preferable that a fabric carrier is additionally provided. In this case, it is preferable that the printing device, the heater for heat-treating the fabric, and the press for pressing a sheet material for heat treatment are arranged in series in the fabric carrying direction. In an alternative preferred embodiment, the heater for heat-treating the fabric is disposed substantially in the same section of the apparatus as that for pressing a sheet material against the heat-treated fabric for heat treatment.

The heat transfer printer, impact printer or ink jet printer, etc. used as the printing device usually refers to a printer which is controlled and has information applied by an external computer, etc. when it prints such information as characters, image or identification mark, etc. However, in addition to this function as a so-called printer, it is preferable that the printer has an optical reader so that it can print at the printing section the image, etc.

read by the reader as it is or after editing or processing. This function allows any optical image, etc. to be easily printed on a fabric, and furthermore in combination with the editing function, can variously process the original image for printing. The editing and processing functions basically include, but are not limited to, a scaling function to enlarge or reduce an original image in a given two-dimensional rectangular coordinate system in the respective axial directions at the same or different rates, a function to cut out a part of the original image, a function to erase the portions with an area or a number of picture elements larger or smaller than any specified value, a function to change the contrast, a reversing function, a function to convert into a mosaic pattern, etc. It is also preferable suitably to combine these functions. It is also preferable to use a plurality of dyes for printing an image, etc. in multi-color or full color. In this case, it is also preferable to add a function to convert a designated color into another color, to the above functions.

Preferred embodiments of the invention will now be described below in more detail with reference to Examples.

The fabric used in the following examples, on which an image was printed, was an image-recording fabric smooth and compact on the surface prepared by treating a high density fabric composed of extra fine polyester filaments of 0.06 denier (0.067 dtex) by water jet punching, and subsequently calendering.

Example 1

The image-recording fabric was lined with a thick polyester film, and set in a commercially available heat transfer printer, and the fabric was printed using a heat transfer ribbon mainly containing a dye high in sublimation temperature.

The image (temporary image) obtained by the above operation was peeled when partially rubbed, to confirm that it was far from being resistant against washing and friction.

So, the fabric with the temporary image formed was fed in contact with a hot roller, to enable the dye in the temporary image to migrate into the fibers constituting the fabric.

The image was partially rubbed by wet cotton fabric, and the excessive dye not fast deposited was caught by the cotton fabric, to confirm that since the excessive dye had remained on the fabric, the image was poor in fastness to friction.

Subsequently, the fabric was overlapped with paper, and the fabric and paper were fed into contact with a hot roller again, to catch the excessive dye by the paper for removal.

The dyed image thus obtained was rubbed by wet cotton fabric, but the cotton fabric was not contaminated by the excessive dye. Furthermore, even if washing and ironing were repeated, it was confirmed that the clear image remained.

Example 2

The image-recording fabric was treated to prevent blurring, and printed with a bar code using an ink mainly composed of a dye high in sublimation temperature by an ink jet printer. By this operation, the fabric was printed with the bar code as a temporary image.

A 130 μm thick biaxially oriented polyester film was then placed on the fabric so as to overlap the surface bearing the temporary image, and the fabric and film were hot-pressed at 180°C for 1 minute, to enable the dye in the temporary image to migrate into the fibers constituting the fabric and to enable the polyester film to absorb the excessive dye.

The dyed bar code image thus obtained was rubbed by wet cotton fabric, but not caught by it, to confirm that the rubbed bar code could be well read at high reproducibility. This showed that even without effecting reduction washing, etc. for removing the excessive dye, there arose no practical problem.

For comparison, the printed fabric was hot-pressed without overlapping the polyester film. When the image was rubbed by wet cotton fabric, the excessive dye not fast deposited was caught by the cotton fabric, and furthermore on the contrary, the bar code-recorded fabric was contaminated, preventing the bar code from being read.

Moreover, unexpectedly, when the printed fabric was repeatedly hot-pressed without overlapping the polyester film, the dye was transferred to the pressing face of the press and re-transferred to the recording medium. It was found that the phenomenon could also be prevented by a process embodying the present invention.

The process of the present invention for preparing an information-bearing fibrous sheet can be widely applied for clothing, and industrial and fashion fabric goods, etc.

The present invention provides a timely dyeing method which not suggested by conventional techniques, and allows dyeing having in mind application of OA apparatuses. It is therefore expected to trigger the development of quite new applications.

Claims

1. a washless process for providing a fibrous sheet with a permanent information-bearing image, which process comprises printing the fibrous sheet with a colouring agent mainly composed of a dye and removing excessive dye therefrom so as to provide, on the fibrous sheet, the permanent information-bearing image, characterised in that

(i) an image is formed temporarily on the fibrous sheet by a technique selected from a heat transfer technique, an ink jet printing technique, and an impact printing technique;

(ii) the fibrous sheet bearing the temporary image is heated so as to enable the dye to migrate into the fibrous sheet; and

(iii) the excessive dye is removed from the fibrous sheet by a washless process in which a sheet capable of receiving the excessive dye is pressed against the fibrous sheet while heating so as to effect the said excessive dye removal;

the said steps (ii) and (iii) being carried out simultaneously with, or separately from one another.

2. A process according to claim 1, wherein the image is temporarily formed by the heat transfer technique using a heat transfer ribbon.

3. A process according to claim 1, wherein the image is temporarily formed by the impact printing technique using an ink ribbon.

4. A process according to claim 1, wherein the image is temporarily formed by pressing a transfer sheet on which a temporary image is formed against a fibrous sheet while heating.

5. A process according to any preceding claim, wherein the sheet capable of receiving excessive dye is made substantially of a polyester or polyolefin.

6. A process according to any one of claims 1 to 4, wherein the sheet capable of receiving excessive dye is made of a cellulose based material.

7. A process according to any preceding claim, wherein the sheet capable of receiving excessive dye is a film.

8. A process according to any one of claims 1 to 6, wherein the sheet capable of receiving excessive dye is of paper.

9. A process according to any preceding claim, wherein the or each heating step is carried out in the absence of water.

10. A process according to any preceding claim, wherein the step (2) of heating, which enables the dye to migrate into the fibrous sheet, is carried out prior to the step (3) of pressing the sheet capable of receiving excessive dye against the fibrous sheet while heating.

11. A process according to any one of claims 1 to 9, wherein the steps (2) and (3) are carried out simultaneously.

12. A process according to any preceding claim, where-

in the dye is sublimable and the sublimation temperature of the dye is 180°C to 300°C.

13. A process according to any preceding claim, wherein the fibrous sheet is mainly composed of polyester fibers.

14. A process according to any preceding claim, wherein the fibrous sheet is mainly composed of extra fine fibers each of 0.0001 denier to 1 denier (0.00011 to 1.1 dtex).

15. An apparatus for conducting a washless process for providing a fibrous sheet with a permanent information-bearing image, which apparatus comprises a printing device capable of forming a temporary image on a fibrous sheet by printing onto the fibrous sheet a colouring agent mainly composed of a dye using a printing technique carried out in the absence of water and selected from a heat transfer technique using a heat transfer ribbon, an ink jet printing technique and an impact printing technique using an ink ribbon, and a press capable of heat pressing another sheet capable of receiving excessive dye material against the fibrous sheet, so as to enable migration of dye forming the indicia into the fibrous sheet and transfer excessive dye to the said other sheet.

16. An apparatus according to claim 15, which additionally comprises a heater for heat-treating the fibrous sheet, which heater is disposed between the printing device for forming the temporary image and the press for heat pressing another sheet material against the fibrous sheet, whereby the heat treatment with the heater is capable of enabling migration of the dye into the fibrous sheet prior to the said heat pressing.

17. An apparatus according to claim 16, wherein the printing device for forming the temporary image on the fibrous sheet, the heater for heat treating the fibrous sheet and the press for heat pressing another sheet material against the heat-treated fibrous sheet with heat treatment are successively arranged in series in the fibrous sheet carrying direction.

18. An apparatus according to claim 15 or claim 16, which additionally comprises a fibrous sheet carrier.

19. An indicia-bearing fibrous sheet mainly composed of extra fine fibers each of 0.0001 denier to 1 denier (0.00011 to 1.1 dtex), wherein the indicia are applied to the fibrous sheet by a process according to any one of claims 1 to 13.

Patentansprüche

1. Verfahren ohne Waschvorgang, um eine Bahn aus Fasermaterial mit einem permanenten informationstragenden Bild zu versehen, welches Verfahren das Bedrucken der Bahn aus Fasermaterial mit einem Färbemittel, das hauptsächlich aus einem Farbstoff besteht, und das Entfernen von überschüssigem Farbstoff davon umfaßt, um auf der Bahn aus Fasermaterial das permanente informationstragende Bild bereitzustellen, dadurch gekennzeichnet, daß
 - (i) nach einer Technik, die aus einer Wärmetransfertechnik, einer Tintenstrahldrucktechnik und einer Prägedrucktechnik ausgewählt ist, ein Bild temporär auf der Bahn aus Fasermaterial ausgebildet wird;
 - (ii) die das temporäre Bild tragende Bahn aus Fasermaterial erhitzt wird, damit der Farbstoff in die Bahn aus Fasermaterial hineinwandern kann; und
 - (iii) der überschüssige Farbstoff durch ein Verfahren ohne Waschvorgang von der Bahn aus Fasermaterial entfernt wird, bei dem ein Blatt, das zum Aufnehmen des überschüssigen Farbstoffs geeignet ist, unter Erhitzen an die Bahn aus Fasermaterial angepreßt wird, um das Entfernen von überschüssigem Farbstoff durchzuführen;

wobei die Schritte (ii) und (iii) gleichzeitig oder getrennt voneinander durchgeführt werden.
2. Verfahren nach Anspruch 1, worin das Bild durch Wärmetransfertechnik unter Verwendung eines Wärmetransferbandes temporär ausgebildet wird.
3. Verfahren nach Anspruch 1, worin das Bild durch Prägedrucktechnik unter Verwendung eines Farbbandes temporär ausgebildet wird.
4. Verfahren nach Anspruch 1, worin das Bild temporär ausgebildet wird, indem ein Transferblatt, auf dem ein temporäres Bild ausgebildet ist, unter Erhitzung an eine Bahn aus Fasermaterial angepreßt wird.
5. Verfahren nach einem der vorangegangenen Ansprüche, worin das zum Aufnehmen von überschüssigem Farbstoff fähige Blatt im wesentlichen aus Polyester oder Polyolefin besteht.
6. Verfahren nach einem der Ansprüche 1 bis 4, worin das zum Aufnehmen von überschüssigem Farbstoff fähige Blatt aus Material auf Zellulosebasis besteht.
7. Verfahren nach einem der vorangegangenen Ansprüche, worin das zum Aufnehmen von überschüssigem Farbstoff fähige Blatt ein Film ist.
8. Verfahren nach einem der Ansprüche 1 bis 6, worin das zum Aufnehmen von überschüssigem Farbstoff fähige Blatt aus Papier besteht.
9. Verfahren nach einem der vorangegangenen Ansprüche, worin der oder jeder Erhitzungsschritt in Abwesenheit von Wasser durchgeführt wird.
10. Verfahren nach einem der vorangegangenen Ansprüche, worin der Erhitzungsschritt (2), der es ermöglicht, daß der Farbstoff in die Bahn aus Fasermaterial hineinwandert, vor dem Schritt (3) des Anpressens des zum Aufnehmen von überschüssigem Farbstoff fähigen Blatts an die Bahn aus Fasermaterial unter Erwärmung durchgeführt wird.
11. Verfahren nach einem der Ansprüche 1 bis 9, worin die Schritte (2) und (3) gleichzeitig durchgeführt werden.
12. Verfahren nach einem der vorangegangenen Ansprüche, worin der Farbstoff sublimierbar ist und die Sublimationstemperatur des Farbstoffs 180 bis 300 °C beträgt.
13. Verfahren nach einem der vorangegangenen Ansprüche, worin die Bahn aus Fasermaterial hauptsächlich aus Polyesterfasern besteht.
14. Verfahren nach einem der vorangegangenen Ansprüche, worin die Bahn aus Fasermaterial hauptsächlich aus extrafeinen Fasern besteht, die jeweils 0,0001 Denier bis 1 Denier (0,00011 bis 1,1 dtex) aufweisen.
15. Vorrichtung zur Durchführung eines Verfahrens ohne Waschvorgang, um eine Bahn aus Fasermaterial mit einem permanenten informationstragenden Bild zu versehen, welche Vorrichtung eine Druckvorrichtung, die zum Ausbilden eines temporären Bildes auf einer Bahn aus Fasermaterial fähig ist, indem auf die Bahn aus Fasermaterial unter Einsatz einer Drucktechnik, die in Abwesenheit von Wasser durchgeführt wird und ausgewählt ist aus einer Wärmeübertragungstechnik unter Verwendung eines Wärmetransferbandes, einer Tintenstrahldrucktechnik und einer Prägedrucktechnik unter Verwendung eines Farbbandes, ein Färbemittel aufgedruckt wird, das hauptsächlich aus einem Farbstoff besteht, sowie eine Presse umfaßt, die fähig ist, ein weiteres Blatt, das zum Aufnehmen von überschüssigem Farbstoffmaterial fähig ist, an die Bahn aus Fasermaterial anzupressen, um das Wandern von die Zeichen bildendem Farbstoff in

die Bahn aus Fasermaterial und das Übertragen von überschüssigem Farbstoff auf das andere Blatt zu ermöglichen.

16. Vorrichtung nach Anspruch 15, die zusätzlich eine Heizeinrichtung zur Wärmebehandlung der Bahn aus Fasermaterial umfaßt, welche Heizeinrichtung zwischen der Druckvorrichtung zum Ausbilden des temporären Bildes und der Presse zum Heißenpressen eines weiteren Blattmaterials an die Bahn aus Fasermaterial angeordnet ist, wodurch die Wärmebehandlung mit der Heizeinrichtung das Wandern des Farbstoffs in die Bahn aus Fasermaterial hinein vor dem Heißenpressen ermöglichen kann.
17. Vorrichtung nach Anspruch 16, worin die Druckvorrichtung zum Ausbilden des temporären Bildes auf der Bahn aus Fasermaterial, die Heizeinrichtung für die Wärmebehandlung der Bahn aus Fasermaterial und die Presse zum Heißenpressen eines weiteren Blattmaterials an die wärmebehandelte Bahn aus Fasermaterial unter Wärmebehandlung in einer Serie nacheinander in Förderrichtung der Bahn aus Fasermaterial angeordnet sind.
18. Vorrichtung nach einem der Ansprüche 15 oder 16, die zusätzlich einen Träger für die Bahn aus Fasermaterial umfaßt.
19. Zeichentragende Bahn aus Fasermaterial, die hauptsächlich aus extrafeinen Fasern besteht, die jeweils 0,0001 bis 1 Denier (0,00011 bis 1,1 dtex) aufweisen, worin die Zeichen auf die Bahn aus Fasermaterial nach einem Verfahren nach einem der Ansprüche 1 bis 13 aufgebracht sind.

Revendications

1. Procédé sans lavage pour munir une nappe fibreuse d'une image portant des informations permanentes, lequel procédé comprend l'impression de la nappe fibreuse avec un agent colorant composé principalement d'une teinture et l'élimination de la teinture en excès de celle-ci de façon à fournir, sur la nappe fibreuse, l'image portant des informations permanentes, caractérisé en ce que
 - (i) une image est formée temporairement sur la nappe fibreuse par une technique sélectionnée parmi une technique à transfert thermique, une technique d'impression à jet d'encre et une technique d'impression à impact ;
 - (ii) la nappe fibreuse portant l'image temporaire est chauffée de façon à permettre à la teinture de migrer dans la nappe fibreuse ; et
 - (iii) la teinture en excès est éliminée de la nappe fibreuse par un procédé sans lavage dans lequel une nappe capable de recevoir la teinture en excès est pressée contre la nappe fibreuse tout en chauffant de façon à effectuer ladite élimination de teinture en excès ;lesdites étapes (ii) et (iii) étant mises en oeuvre simultanément, ou séparément, l'une de l'autre.
2. Procédé selon la revendication 1, dans lequel l'image est temporairement formée par la technique de transfert thermique en utilisant un ruban à transfert thermique.
3. Procédé selon la revendication 1, dans lequel l'image est temporairement formée par la technique d'impression à impact en utilisant un ruban d'encre.
4. Procédé selon la revendication 1, dans lequel l'image est temporairement formée par pressage d'une feuille de transfert sur laquelle une image temporaire est formée contre une nappe fibreuse tout en chauffant.
5. Procédé selon l'une quelconque des revendications précédentes, dans lequel la nappe capable de recevoir la teinture en excès est faite substantiellement d'un polyester ou une polyoléfine.
6. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel la nappe capable de recevoir la teinture en excès est faite d'un matériau à base de cellulose.
7. Procédé selon l'une quelconque des revendications précédentes, dans lequel la nappe capable de recevoir la teinture en excès est un film.
8. Procédé selon l'une quelconque des revendications 1 à 6, dans lequel la nappe capable de recevoir la teinture en excès est en papier.
9. Procédé selon l'une quelconque des revendications précédentes, dans lequel la ou chaque étape de chauffage est mise en oeuvre en l'absence d'eau.
10. Procédé selon l'une quelconque des revendications précédentes, dans lequel l'étape (2) de chauffage, qui permet à la teinture de migrer dans la nappe fibreuse, est mise en oeuvre avant l'étape (3) de pressage de la nappe capable de recevoir la teinture en excès contre la nappe fibreuse tout en chauffant.
11. Procédé selon l'une quelconque des revendications 1 à 9, dans lequel les étapes (2) et (3) sont mises en oeuvre simultanément.

12. Procédé selon l'une quelconque des revendications précédentes, dans lequel la teinture est sublimable, la température de sublimation de la teinture est de 180°C à 300°C.
13. Procédé selon l'une quelconque des revendications précédentes, dans lequel la nappe fibreuse est principalement composée de fibres de polyester.
14. Procédé selon l'une quelconque des revendications précédentes, dans lequel la nappe fibreuse est principalement composée de fibres extra-fines de chacune 0,0001 denier à 1 denier (0,00011 à 1,1 dtex).
15. Appareil pour conduire un procédé sans lavage pour munir une nappe fibreuse d'une image portant des informations permanentes, lequel appareil comprend un dispositif d'impression capable de former une image temporaire sur une nappe fibreuse par impression sur la nappe fibreuse d'un agent colorant composé principalement d'une teinture en utilisant une technique d'impression mise en oeuvre en l'absence d'eau et sélectionnée parmi une technique de transfert thermique en utilisant un ruban à transfert thermique, une technique d'impression à jet d'encre et une technique d'impression à impact en utilisant un ruban d'encre, et une presse capable de presser thermiquement une autre nappe capable de recevoir un matériau de teinture en excès contre la nappe fibreuse, de façon à permettre la migration de la teinture formant les indices dans la nappe fibreuse et le transfert de la teinture en excès à ladite autre nappe.
16. Appareil selon la revendication 15, qui comprend additionnellement un appareil de chauffage pour traiter thermiquement la nappe fibreuse, lequel appareil de chauffage est disposé entre le dispositif d'impression pour former l'image temporaire et la presse pour presser thermiquement un autre matériau de nappe contre la nappe fibreuse, ce par quoi le traitement thermique avec l'appareil de chauffage est capable de permettre une migration de la teinture dans la feuille fibreuse avant ledit pressage thermique.
17. Appareil selon la revendication 16, dans lequel le dispositif d'impression pour former l'image temporaire sur la feuille fibreuse, l'appareil de chauffage pour traiter thermiquement la nappe fibreuse et la presse pour presser thermiquement un autre matériau de nappe contre la nappe fibreuse traitée thermiquement avec un traitement thermique sont successivement arrangés en série dans la direction de transport de la nappe fibreuse.
18. Appareil selon la revendication 15 ou 16, qui comprend additionnellement un transporteur de nappe

fibreuse.

19. Nappe fibreuse portant des indices composée principalement de fibres extra-fines chacune de 0,0001 denier à 1 denier (0,00011 à 1,1 dtex), dans laquelle les indices sont appliqués à la nappe fibreuse par un procédé selon l'une quelconque des revendications 1 à 13.